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ANDRUS, SCEALES, STARKE & SAWALL, LLP
100 EAST WISCONSIN AVENUE, SUITE 1100
MILWAUKEE, WI 53202

EXAMINER	
BERMAN, JASON	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/508,913	CHANG, ISAAC TSZ HONG	
	Examiner	Art Unit	
	Jason M. Berman	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *2/4/2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *36-68 and 70* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *36-68 and 70* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Status of the Claims

Claims 36-68 and 70 are pending in the current application.

Response to Amendment

Applicant's amendment of 2/4/2009 does not render the application allowable.

Status of the Rejections

The rejection of claims 36-58 are maintained.

The rejection of claims 64 and 70 under 35 USC 112 second paragraph are withdrawn in view of the amendments.

All other rejections from the previous office action are withdrawn in view of applicant's amendment. New grounds of rejection under 35 U.S.C. 103(a) are necessitated by the amendment.

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 36, 38-39, 43-45, 49, 51, 54-55, 57-58 are rejected under 35 U.S.C. 102(b) as being anticipated by Savage (US 4,731,515).

As to claim 36, Savage discloses a process for the production of submicron particles comprising the steps of:

- placing first and second electrodes in a volume of coolant, the electrodes being mutually spaced (Figure 2: showing electrodes 20 and 25 placed in cryogenic fluid 50);
- passing an electrical current across the electrodes whereby to generate an electrical arc there between (Figure 2: showing power supply connected via cables 32 and 34 to electrodes; col 1 lines 38-40: electro-discharge used to produce powder);
- maintaining a stable arc by controlling the relative spacing between the two electrodes to melt or evaporate and separate material from at least one of the electrodes such that droplets of said material are formed (col 2 lines 63-66: means for maintaining a gap between electrodes during erosion of electrodes); and
- Quenching said droplets to form said submicron particles of the material in the coolant (abstract: formation of powder in cryogenic fluid; col 4 line 25: cryogenically solidified powder; col 4 line 56: powder less than 10 microns).

As to claims 38 and 39, Savage discloses the electrodes used in the method are made from metals and are titanium (col 1 line 60: titanium electrodes).

As to claim 43, Savage discloses the coolant is maintained at a temperature of less than 200 K (col 1 line 58: use of liquid argon [boiling point of argon is 85 K]).

As to claim 44, Savage discloses the coolant is liquid nitrogen or liquid argon (col 1 lines 58 and 60-61).

As to claim 45, Savage discloses a quantity of reactant is mixed with an essentially inert coolant such that the material melted/evaporated in step (iii) reacts with the reactant prior to being quenched in step (iv) (col 1 line 59-61: use of liquid nitrogen to from a compound with the metal).

As to claim 49, Savage discloses step (iii) is achieved by moving, preferably continuously, one of the electrodes relative to the other as material is melted/evaporated. (claim 6: means for maintaining the spacing as the electrodes are continuously eroded; col 3 line 15: adjustment of electrode gap [inherently involves moving at least one electrode]).

As to claim 51 Savage discloses the process is a batch process and the particles being recovered after removal of the coolant (col 1 lines 45-47).

As to claim 54, Savage discloses a process for depositing a coating on a substrate comprising the steps:

- placing first and second electrodes in a volume of coolant, the electrodes being mutually spaced (Figure 2: showing electrodes 20 and 25 placed in cryogenic fluid 50); and
- Passing an electrical current across the electrodes whereby to generate an electrical arc there between (Figure 2: showing power supply connected via cables 32 and 34 to electrodes; col 1 lines 38-40: electro-discharge used to produce powder).

It is noted that Savage does not explicitly disclose the formation of a coating on the electrodes. It is inherent that during an arc vaporization process, as disclosed by Savage, that material liberated from the closely aligned electrodes will redeposit on the electrodes thus forming a coating.

As to claim 55, Savage discloses the coolant is liquid nitrogen and the process results in a nitrogen-based coating (col 1 lines 58 and 60-61; col 1 line 59-61: use of liquid nitrogen to from a compound with the metal).

As to claim 57, Savage discloses the electrode serving as the substrate is continuously moved relative to the other electrode, whereby to form a continuous coating on the substrate electrode (col 6 lines 27-30: adjusting spacing between electrodes).

As to claim 58, Kuehnle discloses the electrode serving as the substrate is maintained stationary and is surrounded by the other electrode at a given spacing, whereby to provide a continuous coating on the substrate electrode in a single step operation (Figure 2: showing stationary electrode 25 surrounding movable electrode 20).

3. Claims 36, 38, 45, 48-50, 52, 54, 57-58 are rejected under 35 U.S.C. 102(b) as being anticipated by Kuehnle (US 5,879,518).

As to claim 36, Kuehnle discloses a process for the production of submicron particles comprising the steps of:

- placing first and second electrodes in a volume of coolant, the electrodes being mutually spaced (Figure 4: showing electrodes 66 and 34 and coolant air (114) and argon around the electrodes);

- passing an electrical current across the electrodes whereby to generate an electrical arc therebetween (abstract: arc ignited across gap by a potential difference);
- maintaining a stable arc by controlling the relative spacing between the two electrodes to melt or evaporate and separate material from at least one of the electrodes such that droplets of said material are formed (claim 16: means for regulating gap width to maintain energy flow between electrodes); and
- Quenching said droplets to form said submicron particles of the material in the coolant (col 1 line 41: nanosize particles generated; abstract: gas released cooled and condensed into droplets).

As to claim 38, Kuehnle discloses the electrodes used in the method are made from metals (col 6 lines 30-32).

As to claim 45, Kuehnle discloses a quantity of reactant is mixed with an essentially inert coolant such that the material melted/evaporated in step (iii) reacts with the reactant prior to being quenched in step (iv) (col 6 lines 10-18: addition of dopant gas to react with vapor before solidification).

As to claim 48, Kuehnle discloses that during step (iii), a flow of coolant is introduced into the spacing between the electrodes whereby to displace droplets out of the hot zone of the arc (figure 4: showing argon flowing through hollow tube electrodes, pushing vapor droplets outwards [arrows]; claim 5).

As to claim 49, Kuehnle discloses step (iii) is achieved by moving, preferably continuously, one of the electrodes relative to the other as material is

melted/evaporated. (col 4 lines 20-24: advancing electrode to maintain gap distance).

As to claim 50, Kuehnle discloses during step (iii), relative rotation is induced between the electrodes whereby to promote separation of the material from the electrode (col 4 lines 25-27).

As to claim 52, Kuehnle discloses the process is continuous, the method including a step of continuously passing coolant over the electrodes (col 6 lines 20-25; claim 5).

As to claim 54, Kuehnle discloses a process for depositing a coating on a substrate comprising the steps:

- placing first and second electrodes in a volume of coolant, the electrodes being mutually spaced (Figure 4: showing electrodes 66 and 34 and coolant air (114) and argon around the electrodes);
- Passing an electrical current across the electrodes whereby to generate an electrical arc therebetween (abstract: arc ignited across gap by a potential difference).

It is noted that Kuehnle does not explicitly disclose the formation of a coating on the electrodes. It is inherent that during an arc vaporization process, as disclosed by Kuehnle, that material liberated from the closely aligned electrodes will redeposit on the electrodes thus forming a coating.

As to claim 57, Kuehnle discloses the electrode serving as the substrate is continuously moved relative to the other electrode, whereby to form a continuous coating on the substrate electrode (col 4 lines 25-27).

As to claim 58, Kuehnle discloses the electrode serving as the substrate is maintained stationary and is surrounded by the other electrode at a given spacing, whereby to provide a continuous coating on the substrate electrode in a single step operation (Figure 4: showing both electrodes surrounded by collar 22 as to be fully exposed to each other).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. Claim 37 is rejected under 35 U.S.C. 103(a) as being unpatentable over Savage, as applied to claim 36 above, and further in view of Harris (US 3,997,748).

As to claim 37, Savage is silent as to the electrodes being initially in contact when the electrical current is passed through them, the arc being created by moving them apart.

Harris discloses a method of arc discharge (abstract) Harris also discloses the electrodes initially being in contact with one another when electrical current is passed through them, creating an arc by moving the electrodes apart (col 2 lines 31-37).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to induce an arc by contact and separation of electrodes, as disclosed by Harris, in the method of forming particles of Savage, because contact and separation is an effective method of initiating an arc.

7. Claim 37 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kuehnle, as applied to claim 36 above, and further in view of Harris (US 3,997,748).

As to claim 37, Kuehnle is silent as to the electrodes being initially in contact when the electrical current is passed through them, the arc being created by moving them apart.

Harris discloses a method of arc discharge (abstract) Harris also discloses the electrodes initially being in contact with one another when electrical current is passed through them, creating an arc by moving the electrodes apart (col 2 lines 31-37).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to induce an arc by contact and separation of

electrodes, as disclosed by Harris, in the method of forming particles of Kuehnle, because contact and separation is an effective method of initiating an arc.

8. Claims 53 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kuehnle as applied to claim 52 above, and further in view of Zurecki (US 5,294,242).

As to claims 53 Kuehnle is silent as to the recycling of the coolant through an inlet and outlet for coolant with powder recovery being downstream of the container.

Zurecki discloses a method of forming a powder by an electric arc between two electrodes, and subsequently quenching the powder in a cryogenic coolant (abstract, figure 1). Zurecki also discloses of a recycling method and apparatus with an outlet and inlet for the coolant and a coolant return circuit being provided between the outlet and inlet and a powder recovery region being downstream of the container (Figure 1: showing coolant and particles exiting container 100 by outlet 111 into recovery container 200 where coolant returns via inlet 219 to container 100).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to include a method for coolant recycling, as disclosed by Zurecki, in the method of forming a powder of Kuehnle, because recycling coolant reduces costs associated with a continuous process.

9. Claim 56 is rejected under 35 U.S.C. 103(a) as being unpatentable over Savage.

As to claim 56, Savage does not explicitly disclose a coating at least 1 um thick.

Savage discloses the claimed invention except for the coating thickness. It would have been obvious to one having ordinary skill in the art at the time of the invention was made to create a coating of at least 1 um since it has been held "where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). MPEP 2144.05 II.

10. Claim 56 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kuehnle.

As to claim 56, Kuehnle does not explicitly disclose a coating at least 1 um thick.

Kuehnle discloses the claimed invention except for the coating thickness. It would have been obvious to one having ordinary skill in the art at the time of the invention was made to create a coating of at least 1 um since it has been held "where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). MPEP 2144.05 II.

11. Claims 40-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Savage, as applied to claims 36 and 59, and further in view of the English Translation of Yanagiya (English Translation JP 07070615A).

As to claim 40, Savage is silent as to the use of bilayer or multilayer electrodes.

Yanagiya discloses a composite electrode for the production of powder (English translation abstract). Yanagiya also discloses the formation of multilayer electrodes (figures 1 and 2). The multilayer design allows for the formation of a powder of desired elemental ratio (abstract) and allows formation of the electrode from weak materials (English translation detailed description: paragraph 3).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a multilayer electrode, as disclosed by Yanagiya, in the method of forming a powder of Savage, because a multilayer electrode allows for formation of multi-component powders from structurally weak elements.

As to claims 41 and 42, Yanagiya discloses an electrode with an inner core of Fe and an outer layer of Cu (English translation paragraph 12: pure Fe inside with NdFeBCu outer layer).

12. Claims 40-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuehnle, as applied to claim 36 above, and further in view of the English Translation of Yanagiya (English Translation JP 07070615A).

As to claim 40, Kuehnle is silent as to the use of bilayer or multilayer electrodes.

Yanagiya discloses a composite electrode for the production of powder (English translation abstract). Yanagiya also discloses the formation of multilayer electrodes (figures 1 and 2). The multilayer design allows for the formation of a

powder of desired elemental ratio (abstract) and allows formation of the electrode from weak materials (English translation detailed description: paragraph 3).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a multilayer electrode, as disclosed by Yanagiya, in the method of forming a powder of Kuehnle, because a multilayer electrode allows for formation of multi-component powders from structurally weak elements.

As to claims 41 and 42, Yanagiya discloses an electrode with an inner core of Fe and an outer layer of Cu (English translation paragraph 12: pure Fe inside with NdFeBCu outer layer).

13. Claims 46 and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Savage, as applied to claim 36 above, and further in view of Kemp (US 4,763,423).

As to claims 46 and 47, Savage is silent as to the addition of solvent and surfactant to the coolant.

Kemp discloses a method for removing a fine metal powder from a liquid (abstract). Kemp also discloses the addition of solvent and surfactant to the liquid to aid in the separation process (col 1 lines 42-46). The addition of solvent and surfactant is disclosed as effective for drying powder which are difficult to dry because of their large surface areas.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to introduce solvent and surfactant into the liquid, as disclosed by Kemp, in the method of producing a powder of Savage, because

solvents and surfactants help the difficult separation of the fine powder from the liquid.

14. Claims 46 and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuehnle, as applied to claim 36 above, and further in view of Kemp (US 4,763,423).

As to claims 46 and 47, Kuehnle is silent as to the addition of solvent and surfactant to the coolant.

Kemp discloses a method for removing a fine metal powder from a liquid (abstract). Kemp also discloses the addition of solvent and surfactant to the liquid to aid in the separation process (col 1 lines 42-46). The addition of solvent and surfactant is disclosed as effective for drying powder which are difficult to dry because of their large surface areas.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to introduce solvent and surfactant into the liquid, as disclosed by Kemp, in the method of producing a powder of Kuehnle, because solvents and surfactants help the difficult separation of the fine powder from the liquid.

15. Claims 59, 63-67 and 70 rejected under 35 U.S.C. 103(a) as being unpatentable over Kuehnle in view of Zurecki.

As to claim 59, Kuehnle discloses an apparatus for the production of submicron particles, said apparatus comprising:

- a sealable container for coolant (figure 1: showing chamber 10);

- an anode and a cathode mounted within the container (figure 1: showing electrodes 66 and 34);
- power supply means for passing a current between the anode and cathode (figure 1: showing power source 104); and
- Adjustment means operably connected with at least one of the anode and cathode for controlling the spacing therebetween (figure 1: showing gears 78 and 39 and screws 72 and 38 for adjusting gap 'G').

Kuehnle is silent as to the recycling of the coolant through an inlet and outlet for coolant with powder recovery being downstream of the container.

Zurecki discloses a method of forming a powder by an electric arc between two electrodes, and subsequently quenching the powder in a cryogenic coolant (abstract, figure 1). Zurecki also discloses of a recycling method and apparatus with an outlet and inlet for the coolant and a coolant return circuit being provided between the outlet and inlet and a powder recovery region being downstream of the container (Figure 1: showing coolant and particles exiting container 100 by outlet 111 into recovery container 200 where coolant returns via inlet 219 to container 100).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to include a method for coolant recycling, as disclosed by Zurecki, in the method of forming a powder of Kuehnle, because recycling coolant reduces costs associated with a continuous process.

As to claim 63, Kuehnle discloses a supporting frame is provided for the anode, cathode and adjustment means, which components together with the supporting frame constitute an assembly which is removable from the container (Figure 2: showing collar 42 for electrode 34 connecting adjustment gear and thread 39 and 38 [mirror system for other electrode not shown] all capable of being removed from chamber 12).

As to claim 64, Kuehnle discloses the adjustment means comprises a rod connected to one of the anode and cathode, the rod extending to the anode or cathode through a wall of the container (Figure 1 - showing gears to adjust location of anode and cathode 34 and 66 by tube located outside walls of container 10).

As to claim 65, Kuehnle discloses the rod is screw-threadingly engaged (Figure 1: showing screw threads 38).

It is noted that Kuehnle discloses the claimed invention except for the screw threads engaged in the wall of the container. Kuehnle is silent as to the exact location of the threading and it would have been obvious to one having ordinary skill in the art at the time of the invention was made to locate the threads at the wall since it has been held that mere rearranging of parts of an invention involves only routine skill in the art. In re Japikse, 86 USPQ 70. MPEP 2144 VI (C).

As to claim 66 and 67, Kuehnle discloses a control for regulating the voltage across the electrodes (claim 16).

As to claim 70, Kuehnle discloses the container is provided with a powder recovery region (Figure 1: showing recovery traps labeled 13).

16. Claim 60 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kuehnle in view of Zurecki, as applied to claim 59 above, and further in view of Boxman (US 4,645,895).

Kuehnle is silent as to the anode/cathode combination being tungsten-steel or graphite-steel.

Boxman discloses a method of coating a workpiece by arc discharge between an anode and cathode (abstract). Boxman also discloses the use of a tungsten-steel or graphite-steel anode/cathode combination (col 10 lines 57-59: tungsten and steel; col 13 lines 30-33: graphite and steel).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use the anode/cathode combinations of Boxman with the apparatus of Savage or Kuehnle, because tungsten and graphite have desirable resistance properties (Boxman at col 13 line 63).

17. Claims 61-62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuehnle in view of Zurecki, as applied to claim 59 above, and further in view of Yanagiya.

As to claim 61, Kuehnle is silent as to the electrodes comprising more than one material which react before solidification.

Yanagiya also discloses the formation of multilayer electrodes which result in multi-component powders (figures 1 and 2; English translation paragraph 9: formation of TbFe2 powder from Fe and Tb layered electrode). The multilayer

design allows for the formation of a powder of desired elemental ratio (abstract) and allows formation of the electrode from weak materials (English translation detailed description: paragraph 3).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a multilayer electrode, as disclosed by Yanagiya, in the method of forming a powder of Kuehnle, because a multilayer electrode allows for formation of multi-component powders from structurally weak elements.

As to claim 62, Yanagiya discloses the anode and/or cathode may comprise bi-layer or multilayer structures of different materials, such that the layer structures are maintained in the submicron particles formed at the end of the process (English translation abstract).

18. Claim 68 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kuehnle in view of Zurecki, as applied to claim 67 under 35 U.S.C. 102(b) above, and further in view of Aoyama (US 4,657,384).

As to claim 68, Kuehnle is silent as to the use of a spectrometer to measure the temperature by monitoring the intensity or wavelength of light produced by the arc.

Aoyama discloses a method of quickly and accurately measuring temperature (abstract). Aoyama also discloses the use a spectrometer to indirectly measure temperature by monitoring the intensity of light produced by a target (col 2 lines 17-23).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to determine a temperature by monitoring the intensity of light produced, as disclosed by Aoyama, in the method of Kuehnle, because excessive temperatures are detrimental to arc vaporization apparatuses and the temperature of an arc cannot easily be directly measured.

Response to Arguments

19. Applicant argues on pages 8-9 of the remarks that Savage does not anticipate the claimed limitation of "maintaining a stable arc" because Savage discloses a method in which a pulsed arc is used. During each of these pulses, however, an arc is established and maintained. There is no claim limitation as to the length of duration of the maintaining of an arc. This argument is therefore not found persuasive.

20. Applicant argues on page 9 of the remarks that Savage does not disclose "submicron" sized particles. Although Savage does disclose operating conditions which create larger particles sizes, as pointed out by applicant, Savage also discloses operating parameters which produce "many small, less than 10 microns" particles. This operation will inherently create particles in the submicron range. No claim limitation as to the percentage or number of submicron particles created during the operation is given.

21. Applicant argues on page 9 of the remarks that Savage does not discloses a coating formed on an electrode. Savage discloses a method in which particles from an electrode are physically blasted off of an electrode by an arc of

electricity. It is inherent that any structure near this occurrence will be struck by particles ejected at high speed and energy by this arc. Even though this coating does not fall within the disclosed purpose of the invention Savage, as pointed out by applicant, it will inherently occur as a result of each electrode being within close proximity of one another during an arcing process.

22. Applicant argues on page 10 of the remarks that Kuehnle does not disclose the electrodes being placed in a volume of coolant. Applicant points out that the "cold gas" is "passed through the interior of the electrodes" and the gas "is heated by passage through the electrodes." This would appear to be the definition of an electrode coolant - heat passing from the electrode to the gas, regardless of the disclosed primary purpose of the gas by Kuehnle. Additionally, Kuehnle explicitly states the gas is used to cool the electrodes (col 4 lines 30-34: electrodes cooled by upflowing gas).

23. Applicant argues on page 10 of the remarks that Kuehnle does not discloses a coating formed on an electrode. Savage discloses a method in which particles from an electrode are physically blasted off of an electrode by an arc of electricity. It is inherent that any structure near this occurrence will be struck by particles ejected at high speed and energy by this arc. Even though this coating does not fall within the disclosed purpose of the invention of Kuehnle, as pointed out by applicant, it will inherently occur as a result of each electrode being within close proximity of one another during an arcing process. Whether or not the particles are solidified, they will strike and coat the proximate electrodes.

24. Applicant argues on page 11 of the remarks that Harris is not applicable as it is directed towards the prevention of arcing in a vacuum. Applicant points to col 1 lines 52 to 58: "Protection of the **arc electrode** contacts from high electric fields... is desirable in order to prevent **reestablishment** of an arc..." (Emphasis added). This selection would seem to indicate the method of Harris is in fact directed towards an arc generation process and includes a method of preventing arcing during a portion of the process when arcing is not desired. Harris, as discussed above, explicitly discloses the process known in the art of "initiating an arc therebetween [the electrodes]" by "contact separation" (col 2 lines 34-38).

25. Applicant argues on page 11 of the remarks that Zurecki does not disclose the separation of particles from the coolant and returning of coolant to the electrodes. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). It would be the combination of Kuehnle, with does flow coolant to the electrodes, in view of Zurecki, relied upon for its recycle discussed in the rejection above, which would anticipate the current claim.

Applicant also argues Zurecki does not allow recovery of powder from the cryogen. Column 4 lines 36-60 of Zurecki discloses a sample procedure in which "a mixture of cryogen and solid particles is withdrawn from the second vessel, the

liquid cryogen is vaporized, and the solid particles are recovered..." This argument is therefore not found persuasive.

26. Applicant argues on pages 11-12 of the remarks that the choice of a particular thickness of coating is not obvious in view of the disclosures of Savage and Kuehnle. As discussed above, the creation of a coating of the material being blasted into particulate form would inherently coat all nearby structures. One of ordinary skill in the art would recognize that the longer the process is performed, the thicker any such coating would become. It would have been obvious to one of ordinary skill in the art at the time of the invention to carry out the process for the time required to obtain any desired coating thickness.

27. Applicant argues on page 12 of the remarks that the rotation of Yanagiya is not possible with Savage and Kuehnle. Kuehnle explicitly states that rotation of the electrodes is desirable (col 4 lines 25-34). No indication is given as to why the apparatus or method of Savage is not possible, given one of ordinary skill would recognize the benefits of rotation: increased erosion surface, prevention of overheating, production of compound materials when using the electrode of Yanagiya, etc.

28. Applicant argues on page 12 of the remarks that Kemp is not applicable to either Savage or Kuehnle because neither of these methods involve the use of water, while Kemp is directed towards the use of a surfactant to separate metal particles from water. One of ordinary skill would recognize the known principle, as disclosed by Kemp, of surfactants being useful for the separation of particles from any entraining fluid by the nature of the surfactant. Regardless of the use of

water, one of ordinary skill would recognize the benefits of surfactant use in the recovery of particles, furthering the benefits of Savage and Kuehnle's disclosures.

29. Applicant's arguments on pages 12-13 with respect to Boxman and Aoyama appear to be based upon the rejected claims dependence upon claims 59 and 69. Therefore, these arguments are not found persuasive in view of the rejections and arguments made above.

Conclusion

30. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason M. Berman whose telephone number is (571)270-5265. The examiner can normally be reached on M-R 8am-5pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571)272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Nam X Nguyen/
Supervisory Patent Examiner, Art Unit 1753

/J. M. B./
Examiner, Art Unit 1795